DEADLOCK ON THE BOARD*

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Abstract

We develop a dynamic model of board decision making. We show that directors may knowingly retain the policy they all think is the worst just because they fear they may disagree about what policy is best in the future—the fear of deadlock begets deadlock. Board diversity can exacerbate deadlock. Hence, shareholders may optimally appoint a biased director to avoid deadlock, whereas a CEO may appoint an independent director to create deadlock, and thus entrench himself. Our theory thus gives a new explanation for CEO entrenchment. It also gives a new perspective on director tenure, staggered boards, and short-termism.

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1 Introduction

Corporations are often too slow to change. Notably, only two percent of corporations fire their CEOs each year, a number said to be so low due to managerial entrenchment (e.g., Bebchuk and Fried (2004)). Indeed, according to Taylor's (2010) estimates, entrenchment reduces the CEO firing rate sixfold.[1] Given that each CEO controls many assets, the resulting misallocation of managerial talent can have large welfare costs. But not only CEOs are entrenched—corporate policies are "entrenched" too. Corporations frequently fail to adapt their strategies to environmental changes. They keep current policies in place, at the expense of their competitiveness (e.g., Hannan and Freeman (1984), Hopkins, Mallette, and Hopkins (2013)). In this paper we argue that such entrenchment can result from deadlock on the board, i.e. from "inaction or neutralization caused by the opposition of persons or of factions" on the board (Kim (2003), p. 112). Indeed, deadlock on the board can be so costly to US corporations that most states have adopted deadlock statutes, which provide remedies to resolve deadlock in court ex post. But why does deadlock arise in the first place? And can it be avoided ex ante, e.g., by appointing the right mix of directors?

We develop a dynamic model of board decision making in which deadlock on the board is the result of the fear of future deadlock: directors refuse to replace a current policy with a new one because they fear that other directors will refuse to replace the new policy in the future. We analyze how board composition can cause or resolve such a deadlock. We find that, the benefits of boardroom diversity notwithstanding,[2] it can exacerbate deadlock. So can long director tenures, another hotly debated policy issue.[3] Likewise, director independence, now a cornerstone of corporate governance and regulatory reform, has a downside: it can make other directors more resistant to value-improving policies. Moreover, the anticipation of

[1] Specifically, Taylor (2010) finds that "eliminat[ing] entrenchment...holding all other parameters constant, the simulated CEO firing rate rises from 2% to 13% per year" (p. 2054).

[2] See Ferreira (2010) for a survey of the literature on boardroom diversity.

[3] See, e.g., "Big Investors Question Corporate Board Tenures" (*Wall Street Journal*, March 23, 2016) and Katz and McIntosh (2014).

deadlock can affect board composition via director elections. Shareholders elect directors to avoid deadlock, possibly voting for a director who does not represent their interest but will get along with the rest of the board. In contrast, a CEO may aim to create deadlock, possibly favoring a director who does not get along with the rest of the board, since a deadlocked board will struggle to fire him.

Model preview. In the model, a board made up of multiple directors decides on a corporate policy at each date. The model is based on three key assumptions, reflecting how real-world boards operate. (i) Directors have different preferences over policies. We refer to these different preferences as "biases," as they could reflect misspecified beliefs or anticipated perks. However, they could also reflect reasonable diversity of opinion. For example, in the context of CEO turnover decisions, an activist's representative on the board could be biased toward an outside candidate with a history of asset divestitures, and an executive director toward an internal candidate with experience at the firm. (ii) The set of feasible policies changes over time. For example, different candidates are available to replace the CEO at each date. (iii) The status quo stays in place whenever the board does not come to a decision. For example, if the board cannot agree on a replacement, the current CEO keeps the job.

Results preview. First, we ask when the board will replace an existing policy with a new one. We find that deadlock on the board can lead directors to knowingly retain a Pareto-dominated policy. In the context of CEO turnover, this implies that a CEO can be so severely entrenched that he is not fired even if all directors prefer a replacement. To see why, consider a firm with a bad incumbent CEO, whom the board is considering replacing with an alternative. Suppose all directors agree that the alternative is better than the incumbent, but some directors are especially biased toward him. For example, activist representatives could be biased toward an alternative with a history of divestment, as touched on above. Then, if the alternative becomes the new CEO, the biased directors will try to keep him in place, voting down alternatives in the future, no matter how much other directors prefer

them—the new CEO will become entrenched. To prevent this, other (sufficiently patient) directors will block the alternative today, keeping the bad incumbent CEO in place—the incumbent CEO becomes entrenched. Thus, the fear of entrenchment begets entrenchment.

This mechanism resonates with practice. For example, Uber's recent search for a new CEO was hindered by disagreement among its directors; moreover, one director was pushing for a weak CEO who would be easy to replace in the future. According to Bloomberg (Newcomer (2017), emphasis added):

> The company hopes to lock in a CEO by early September. The big question is whether the board can get on the same page. Getting a majority of the eight-person group to support a single candidate is looking to be difficult.... Some...have argued...that Kalanick [a current director and former CEO of Uber] would *prefer a weak CEO just to increase his chance of making a comeback.*[4]

Second, we ask whether director tenure should be limited. In the current debate (e.g., Katz and McIntosh (2014)),[5] arguments against long director tenure focus on concerns about independence and the lack of fresh ideas. Our analysis suggests an independent yet complementary argument for shorter tenures: in anticipation of a long tenure, directors behave strategically, creating deadlock. More generally, our analysis uncovers a cost of long-termism: directors concerned about the long-term are more likely to vote strategically and block good candidates today, creating deadlock. This provides a counterpoint to the broadly negative view of corporate short-termism.

[4]See also "Investor Benchmark Capital Sues Uber Ex-CEO Travis Kalanick" (*Wall Street Journal*, August 10, 2017), according to which "some investors have alleged that Mr. Kalanick...[was] impeding the search, including by rejecting qualified candidates."

[5]While many countries, such as the UK, Hong Kong, Singapore, and several EU countries, have adopted some form of term limits for independent directors, the US and Canada do not yet have any specific regulatory guidelines on director tenure. However, many institutional investors, such as BlackRock and State Street, deem director tenures in the US as too long and are voting against reappointments, leading commentators to suggest that director tenure is "the next boardroom battle" (Libit and Freier (2016), p. 5; see also Francis and Lublin (2016)).

Third, we ask how board composition affects deadlock. We find that board diversity has a downside: it can exacerbate deadlock. For example, the deadlock caused by an activist's bias toward divestiture is not resolved by adding some executive directors biased toward investment. These directors will block divestiture-oriented policies, even if they agree that they are optimal today, just to preserve a strong bargaining position for the future. More generally, heterogeneous director biases do not cancel out—they do not yield a board that implements policies in shareholders' interests. Rather, they can yield a board that does not implement any policies at all. This is in line with the empirical findings in Goodstein, Gautam, and Boeker (1994) and Knyazeva, Knyazeva, and Raheja (2013) that diversity of directors' skill and experience is negatively associated with strategic change and firm value, respectively. Our results thus offer a counterpoint to the blanket view that a "board should reflect a diversity of thought, backgrounds, skills, experiences and expertise" (Business Roundtable (2016), p. 11). However, that is not to say that a diverse board is all bad in our model. The short-term deadlock created by opposing biases can also benefit shareholders—by blocking policies that some directors are biased toward, a diverse board can prevent permanent tyranny of a biased board.

Continuing the analysis of board composition, we ask how adding independent directors affects deadlock. We find that even if independent directors act purely in shareholders' interest, adding them to the board can make shareholders strictly worse off. To see why, observe that if all directors are biased the same way, they are never deadlocked (although sometimes they act against the interest of shareholders). If some directors are replaced with independent directors, the biased directors will respond strategically. They have extra incentive to block shareholder-friendly policies to improve their future bargaining positions. However, independent directors can also benefit shareholders. Not only do they favor value-maximizing policies, but, like a diverse board, they also block policies that other directors are biased toward to prevent them from becoming entrenched. This strategic behavior can make independent directors appear passive or biased in the short-term: they may block policies

that enhance short-term value so that they can implement policies that maximize long-term value in the future.

This mechanism was recently manifested at railroad company CSX. There, activist investor Paul Hilal demanded that CSX replace the incumbent CEO by a veteran railroad executive Hunter Harrison and, in addition, give Hilal and Harrison six seats on the board. Although Harrison was widely considered to be the perfect candidate to lead CSX, directors were reluctant to agree to the activist's demands: they probably worried that, given support from the new directors, the new CEO would be hard to replace in the future. Hence, they seemed biased, blocking an alternative that was good in the short term, to prevent entrenchment, which could be bad for the firm in the long term.[6]

Fourth, we ask how deadlock affects director appointments. As an immediate result of our board-composition analysis, we find that shareholders, who want to prevent deadlock, may prefer to appoint a biased director than an independent director. However, shareholders do not have full control over director appointments in practice. The CEO often exerts influence over the appointment of new board members (e.g., Hermalin and Weisbach (1998), Shivdasani and Yermack (1999)). We find that even if the CEO's only goal is to retain his position, he will not always appoint directors who are biased towards him. He may prefer directors who are independent, or even biased against him. The reason is that they may exacerbate deadlock on the board. Since deadlock makes it hard to fire the CEO, such strategic director appointments can help the CEO entrench himself.

Related literature. A relatively small number of theory papers studies decision making by multiple directors on a corporate board.[7] We contribute to this literature by modeling dynamic decision making, which none of these papers study. Indeed, none of our results would obtain with a one-shot decision: deadlock would not arise,

[6]See, e.g., "The $10 Billion Battle for CSX Stock Will Be Decided Shortly" (*Fortune*, February 15, 2017). Eventually, after gathering the opinion of the company's investors, the board agreed to the activist's demands.

[7]See Baranchuk and Dybvig (2009), Chemmanur and Fedaseyeu (2017), Harris and Raviv (2008), Levit and Malenko (2016), Malenko (2014), and Warther (1998).

the board would always replace a Pareto-dominated policy, shareholders would never prefer a biased director to an independent one, and the CEO would always favor a director biased toward him.

We also add to the broader theory literature on boards.[8] Our finding that director independence can exacerbate deadlock complements existing work on the downsides of independence.[9] And our finding that a CEO may prefer to appoint independent directors, even when they may fire him in the future, contrasts with Hermalin and Weisbach (1998), another paper in which a CEO appoints directors with the power to fire him.

Some political economy papers, notably Dziuda and Loeper (2016), do study environments like ours with "dynamic collective choice with endogenous status quo."[10] To our knowledge, they all restrict attention to exogenously specified committees. We contribute to this literature by studying board composition, which generates our results on biased vs. diverse boards, biased vs. independent directors, and shareholder- vs. CEO-appointed directors.

Our explanation of entrenchment, which is based only on directors' strategic behavior, contrasts with those in the finance literature, which are based largely on a CEO's actively entrenching himself (e.g., "invest[ing] in businesses related to their own background and experience")[11] or directors' direct utility costs of firing a CEO (e.g., because he is a friend).[12]

[8] See Adams, Hermalin, and Weisbach (2010) for a survey.

[9] See Adams and Ferreira (2007), Kumar and Sivaramakrishnan (2008), Laux (2008), and Malenko (2014).

[10] See also Austen-Smith, Dziuda, Harstad, and Leoper (2016), Duggan and Kalandrakis (2012), Dziuda and Leoper (2017), and Zápal (2012).

[11] Shleifer and Vishny (1989), p. 125. See also, e.g., Zwiebel (1996).

[12] See, e.g., Chemmanur and Fedaseyeu (2017), Coles, Daniel, and Naveen (2014), Taylor (2010), and Warther (1998).

2 Model

There is a board comprising two directors, $i \in \{1, 2\}$, who decide on a policy at each of two dates, $t \in \{1, 2\}$. At date t, the board can replace the current "incumbent" policy x_{t-1} with an alternative policy y_t. Decisions are made by strict majority voting: if both directors vote for the alternative y_t, then y_t becomes the incumbent policy, $x_t = y_t$; otherwise, the incumbent policy stays in place, $x_t = x_{t-1}$. The policy in place creates value $v(x_t)$ at date t, so shareholders get $v(x_1) + \delta v(x_2)$, where δ is the rate of time preference (where we allow for $\delta > 1$, since date 2 may represent more calendar time than date 1). Directors care about firm value, but they can be biased. Each director i maximizes the sum $v(x_1) + b_i(x_1) + \delta\big(v(x_2) + b_i(x_2)\big)$, where b_i is her bias.

Policies differ in two dimensions: in how much value they create for shareholders and in how much they appeal to biased directors. We capture shareholder value with "quality" $q \in \{h, \ell\}$. If an alternative y_t is of high quality h, then $v(y_t) = v_h$; if y_t is of low(er) quality ℓ, then $v(y_t) = v_\ell < v_h$. We capture the appeal to biased directors by adding a "bias" type $\tau \in \{\alpha, \beta\}$ to each policy and allowing directors to be either α- or β-biased, where a τ-biased director gets $b_i(y_t) = b_\tau$ if the policy y_t is type τ and $b_i(y_t) = 0$ otherwise. We also allow for unbiased (independent) directors, for whom $b_i(y_t) = 0$ for all policies y_t.

We assume that the qualities and bias types are i.i.d. at date 1 and date 2. p_q and p_τ denote the probabilities that an alternative y_t is of quality $q \in \{h, \ell\}$ and of bias type $\tau \in \{\alpha, \beta\}$, respectively. $\bar{v} := p_h v_h + p_\ell v_\ell$ denotes the average quality of y_t and $v_0 := v(x_0)$ denotes the quality of the initial incumbent policy x_0.[13]

As touched on in the Introduction, disagreement among directors is common on corporate boards.[14] To capture this, we assume that the directors can be sufficiently

[13] An alternative policy y_t is of four types $h\alpha$, $h\beta$, $\ell\alpha$, and $\ell\beta$. However, the initial policy x_0 is not necessarily one of these types. We allow for this because we are interested in the case in which a policy x_0 is entrenched even though it is "worse" than *any* alternative y_t (see Section 3).

[14] For example, a recent survey of global directors emphasizes the importance of disagreement on boards as follows: "In the boardroom, disagreements are often unavoidable—especially when

biased that they can disagree about what policy is best.

Assumption 1 *Biased directors are sufficiently biased: for* $\tau \in \{\alpha, \beta\}$*,*

$$b_\tau > \max\left\{ \frac{1+\delta p_\ell}{\delta p_\tau p_\ell}\,,\, 1 \right\} \big(v_h - v_\ell\big). \tag{1}$$

Solution concept. We solve for subgame perfect equilibria—sequentially rational strategies for each director $i \in \{1,2\}$ to vote for/against y_t for $t \in \{1,2\}$ given consistent beliefs—such that directors use the following tie-breaking rules if they are indifferent.

Assumption 2 *Directors do not vote against strictly Pareto-dominant policies at date 2, i.e., a director who is indifferent between* x_1 *and* y_2 *votes in the interest of the other director. If both directors are indifferent, the incumbent stays in place.*

Independent, biased, diverse, and partially independent boards. If a director is unbiased, we refer to her as "independent" and indicate her type with ι. If a director is biased toward τ-policies, we refer to her as τ-biased and indicate her type with τ (so τ can represent a director type as well as a policy type). We use primes to denote the other director or policy: if $\tau = \alpha$, then $\tau' = \beta$, and vice versa. Hence, an ι-ι board is an "independent" board in which both directors are independent; a τ-τ board is a "biased" board in which directors have the same bias; a τ-τ' board is a "diverse" board in which they have opposing biases; and a τ-ι board is a "partially independent" board in which one director is τ-biased and the other is independent.

3 Entrenchment

Until stated otherwise (cf. Section 5), suppose that the initial policy x_0 is "very bad," in that it is worse for shareholders than low-quality alternatives, $v_0 < v_\ell$, and

the board is composed of independent-minded, skilled, and outspoken directors. This is not a bad thing. There should be a debate in the boardroom" (IFC (2014), p. 2).

no director is biased toward it, $b_i(x_0) = 0$ for $i \in \{1, 2\}$. Thus, directors prefer *any* alternative y_t to x_0. Will they always vote to replace it? Not if the board is diverse. In this case, a τ-biased director knows the other director is τ'-biased and, given Assumption 1, will always vote against replacing a τ'-policy with a τ-alternative policy at date 2. If the τ-biased director's bias is sufficiently large (as specified in Assumption 1), she finds it optimal to block any τ'-policy today: she wants to preserve the option to get her way in the future, which is harder the more dissatisfied the other director is with the status quo.

Proposition 1 (ENTRENCHMENT.) *Given a diverse (τ-τ') board, the incumbent policy x_0 is entrenched: no replacement is ever appointed at date 1.*

At date 1, a τ-biased director votes against all τ' policies. So, with a diverse board, the α-biased director votes against all β-policies and the β-biased director votes against all α-policies. This leaves x_0 in place at date 1, even though both directors would be strictly better off with any other policy. There is complete deadlock: each director votes against policies that would make her better off today to preserve the option of implementing a policy that would make her even better off in the future.

Perhaps the most important function of real-world boards is appointing CEOs. If the incumbent policy x_0 represents the incumbent CEO, and the alternatives y_t potential replacement CEOs, our model generates CEO entrenchment, which seems to be a major source of corporate inefficiency (Taylor (2010)). In our model, unlike in others, entrenchment arises without any opportunistic behavior by the CEO or director disutility of firing. Rather, it arises only due to the constraints imposed by dynamic consistency of multiple directors.

Deadlock in our model results from directors' concern about board negotiations that will occur in the future—directors vote strategically to increase their chances of implementing their preferred policies later in their tenure on the board. The rate of time preference δ in our model can be viewed as a measure of directors' remaining tenure: if a director has a short tenure, she does not care about future policies, so δ

is low; in contrast, if she has a long tenure, she cares a lot about them, so δ is high. This interpretation yields the next corollary.

Corollary 1 (TENURE.) *Suppose (instead of Assumption 1) that $b_\tau > (v_h - v_\ell)/p_\tau$ for each τ. Given a diverse board, increasing director tenure leads to entrenchment in the sense that x_0 is always replaced at date 1 for δ sufficiently small but never replaced for δ sufficiently large.*

Deeming director tenures too long, a number of institutional investors, such as BlackRock and State Street, are now voting against reappointments, leading commentators to suggest that director tenure is "the next boardroom battle" (Libit and Freier (2016), p. 5; see also Francis and Lublin (2016)). The argument for shorter tenures has centered around the idea that after a long tenure, a director may become too close to management and may also lack fresh ideas about the business. Our analysis offers a new, complementary perspective on the downside of long tenures: in anticipation of a long tenure, directors behave strategically, creating deadlock.

More generally, our analysis uncovers a cost of long-termism: long-termism can incentivize strategic voting, exacerbating deadlock. This provides a counterpoint to the broadly negative view of corporate short-termism; see, e.g., the former Vice President Joe Biden's opinion that it "saps the economy" (Biden (2016)).

4 Board Composition

Our results so far show a downside of diverse boards: directors with opposing biases create deadlock. In this section, we ask how board composition can mitigate/aggravate deadlock. Does an independent director on the board resolve deadlock? No. If the other director is biased, she strategically blocks high-quality policies today, knowing the independent director will make them hard to replace in the future:

Lemma 1 (COST OF BOARD DIVERSITY.) *Consider a τ-ι-partially independent board. The τ-biased director votes against the high-quality τ' policy and votes in favor of all other policies.*

Although an independent director does not resolve deadlock, perhaps a biased director can? Yes, in fact. If the other director is biased the same way, she does not strategically block policies today, knowing she will always be able to implement her preferred policies in the future. Hence, board diversity can be bad for shareholders, since deadlock prevents some high-quality policies from getting through.

Proposition 2 (Shareholder optimal board composition.) *Define*

$$\Delta_\tau := \delta p_h(1-p_\tau)\left(v_h - v_\ell\right) - \left(v_\ell - v_0\right). \tag{2}$$

Shareholders are better off with a τ-biased board than a τ-ι-partially independent board if and only if

$$p_\ell p_\tau \Delta_\tau < p_h p_{\tau'}\Big(v_h - v_0 + \delta p_\ell p_{\tau'}(v_h - v_\ell)\Big), \tag{3}$$

and are always better off with a τ-biased or partially independent board than a τ-τ'-diverse board.[15]

Although this result stresses a cost of board diversity, it also suggests a benefit: if one director is biased in one direction, another director, who is not, can prevent her preferred policies from becoming entrenched in the long-term. Namely, on a τ-ι-partially independent board, the independent director may strategically block low quality τ-policies that the τ-biased director would make hard to replace, as summarized in the next corollary.

Corollary 2 (Benefit of board diversity.) *Consider a τ-ι-partially independent board. The independent director votes against the low-quality τ-policy if and only if $\Delta_\tau > 0$ and votes in favor of all other policies.*

[15] See, however, the extension in Appendix A.4.3. There, we show how a diverse board can be better than a biased board if we allow the probability of a high quality alternative to change over time.

Observe that the independent director may appear passive, or even biased, in the short-term, voting against certain policies even though the incumbent policy is even worse, i.e., $v_0 < v_\ell$. This is because she wants to avoid being stuck with a low-quality policy in the long-term: by blocking the low-quality policy that the other director is biased toward, she increases her chances of implementing a high-quality policy in the future.

In summary, an independent director acts in shareholders' interest, strategically blocking policies as long as the long-term benefit of being able to implement a high-quality τ'-policy outweighs the short-term cost of keeping the incumbent policy x_0 in place (this benefit and cost correspond to the two terms in Δ_τ). However, she cannot prevent the biased director from responding strategically herself. This makes shareholders worse off with a τ-ι-partially independent board than with a biased board whenever the benefit from the independent director strategically blocking low-quality τ policies is less than the cost from the τ-biased director strategically blocking high-quality τ' policies (this benefit and cost correspond to the LHS and RHS of equation (3)).

Finally, note that, like a partially independent board, a diverse board also prevents some low-quality policies from being implemented; however, in this baseline specification, it is still never as good as a biased board, since its benefit is more than offset by the biased board preventing date-1 x_0 from becoming entrenched at date 1, and hence getting a better set of policies to choose from at date 2. This is no longer the case if we relax the assumption that the alternative quality is identically distributed, as we show in Appendix A.4.3, to stress this potential benefit of diversity.

5 Appointing Directors

In this section, we study how the possibility of deadlock affects director appointments. Suppose, first, that shareholders have full control over director appointments

and consider a board with a τ-biased director in place and an empty seat to be filled at date 0. Will shareholders necessarily appoint an independent director who will act in their interest? Or a τ'-biased director who will counteract the τ-biased director? Not necessarily. Diverse and partially independent boards are not always good for shareholders since they are prone to deadlock (Proposition 2). Hence, shareholders may appoint a τ-biased director, creating a biased board that makes some bad decisions but avoids deadlock.

Corollary 3 (Shareholders' director appointments.) *Shareholders appoint a τ-biased director if condition (3) holds. Otherwise they appoint an independent director.*

In our setup, shareholders would like to replace all directors at once with independent directors, since a fully independent board always acts exactly in their interest. But practical concerns could make this very unattractive, because, e.g., some incumbent directors have indispensable expertise. Hence, shareholders' director appointments must account for the biases of incumbent directors. Given the costs of deadlock, the best response may be to exacerbate these biases, rather than to attenuate them.

Another reason why shareholders may not be able to replace all directors at once is the presence of a staggered board, which "prevents shareholders from replacing a majority of the board of directors without the passage of at least two annual elections" (Bebchuk and Cohen (2005), p. 410). The literature emphasizes that this can prevent efficient takeovers and proxy fights by forcing bidders and activists to win two far-apart elections (Bebchuk, Coates, and Subramanian (2002)). Our analysis suggests it may be even worse than we thought. If shareholders want to avoid deadlock today, they appoint new directors with biases in line with the current incumbent directors. But with staggered elections, today's new biased directors become tomorrow's incumbent directors. And if shareholders want to avoid deadlock tomorrow, they will appoint biased directors again, and so on ad infinitum. In other words, our analysis suggests that staggered elections may lead the board to

stay biased forever, even after shareholders have replaced every director with a new director.

CEO appoints directors. In practice, shareholders do not always have full control over director appointments: the CEO can appoint some directors to the board as well (Hermalin and Weisbach (1998), Shivdasani and Yermack (1999)). Hence, we ask which directors the CEO will appoint. If his sole objective is to keep his position,[16] will he always appoint directors who are biased toward him? No. In fact, he may prefer to appoint directors biased against him, since this may exacerbate deadlock on the board and make it hard to fire him (Proposition 1).

Here, we return to the interpretation of the incumbent policy x_0 as the incumbent CEO and of the alternatives y_t as potential replacement CEOs (cf. the Introduction and Section 3). It follows from Proposition 1 that a "very bad" CEO chooses a diverse board to entrench himself.

Corollary 4 ("Very bad" CEO's board ranking.) *Given $v_0 < v_\ell$ and $b_i(x_0) = 0$, the incumbent CEO's preference over boards is as follows:*

$$\text{diverse} \succ \text{partially independent} \succeq \text{independent} \sim \text{biased}. \tag{4}$$

So far, we have assumed that no director was biased toward the incumbent policy to explore how a "very bad" policy/CEO could become entrenched. Now, we assume that the CEO is of type τ, to explore how the CEO appoints directors biased toward/against him. A high-quality CEO is only at risk of being fired if a director is biased against him:

Proposition 3 (High-quality CEO's board ranking.) *Given $v_0 = v_h$ and*

[16] I.e., the CEO's objective function is $U = \mathbb{P}\big[\text{employed at date 1}\big]w_1 + \mathbb{P}\big[\text{employed at date 2}\big]w_2$ for some weights or "wages" w_1 and w_2. Only the proof of Proposition 4 depends on the form of the CEO's objective.

$b_i(x_0) = b_\tau$, *the incumbent* τ*-CEO's preference over boards is as follows:*

$$\begin{aligned} \tau\text{-biased} \ \sim \ \text{diverse} \ \sim \ \tau\text{-}\iota\text{-partially independent} \ \sim \ \text{independent} \\ \succ \ \tau'\text{-}\iota\text{-partially independent} \ \succ \ \tau'\text{-biased.} \end{aligned} \tag{5}$$

In contrast to a high-quality CEO, a low-quality CEO is at risk of being fired even by directors biased toward him, since they prefer a high quality CEO of the same type. Thus, like the very bad CEO above, a low-quality CEO wants to exploit deadlock on the board to avoid being fired. In fact, deadlock on the board is more valuable for him than favoritism from the board.

Proposition 4 (Low-quality CEO's board ranking.) *Given* $v_0 = v_\ell$ *and* $b_i(x_0) = b_\tau$*, as long as* p_τ *is sufficiently large,*[17] *the incumbent* τ*-CEO's preference over boards is as follows:*

$$\begin{aligned} \tau\text{-}\iota\text{-partially independent} \ \succ \tau\text{-biased} \ \sim \ \text{diverse} \ \sim \\ \tau\text{-}\iota\text{-partially independent} \ \succ \ \text{independent} \ \succ \ \tau'\text{-biased.} \end{aligned} \tag{7}$$

The low-quality τ-CEO benefits from having a τ-biased director on the board to prevent him from being replaced by any τ'-CEO. However, with a τ-biased director on the board, he is always replaced when a high-quality τ-CEO is available. There is no deadlock: even if the other director is τ'-biased, she will not vote strategically at date 1 because she knows the τ-biased director will prevent her from getting her way at date 2 anyway. Thus, the CEO may be better off with a τ'-ι partially independent board, because there is deadlock: the τ'-biased director votes against the high-quality τ-CEO (to preserve her option of appointing a τ'-CEO tomorrow) and the independent director votes against the low-quality τ'-CEO (to prevent his

[17] Specifically, we require that

$$(p_\tau - p_{\tau'})p_h w_1 > \Big(p_{\tau'} - p_\tau p_h(p_{\tau'}p_h + p_\tau p_\ell)\Big)w_2, \tag{6}$$

where w_1 and w_2 are as in footnote 16. Note that in the proof we also give the low-quality τ-CEO's rankings for other parameters.

entrenchment). Hence, given an empty board seat, the CEO may appoint a director biased against him.

Corollary 5 (LOW-QUALITY τ-CEO'S DIRECTOR APPOINTMENTS.) *Suppose there is an independent director in place and an empty board seat. A τ-CEO appoints a τ'-biased director for some parameters (specified in the proof).*

6 Conclusion

We argue that deadlock on the board can cause pervasive entrenchment, and hence explain why corporations are often too slow to turn over their top management and to adapt their strategies to a changing competitive environment. Our results hinge on the dynamic interaction between multiple directors' decisions, something new to the literature on corporate boards. Indeed, deadlock in our model is entirely a consequence of dynamic consistency: the board is deadlocked because it fears it will become deadlocked in the future.

This dynamic model gives a new take on board composition, director appointments, and director tenure. It suggests board diversity has a downside: it can exacerbate deadlock. As such, even adding independent directors to the board can create deadlock. Hence, shareholders may optimally appoint a biased director to avoid deadlock. On the other hand, the CEO may appoint independent directors, or even directors biased against him, to create deadlock and thereby entrench himself. Finally, we uncover a cost of long director tenure: the more directors focus on the future, the more they vote strategically; they block policies today to preserve a strong bargaining position in the future, creating deadlock in the process.

A Proofs

A.1 Proof of Proposition 1

To prove the proposition, we solve the model backward. The key observation is that if the "very bad" incumbent policy x_0 is in place at date 2, no alternative is blocked. This means that directors have incentive to keep x_0 in place at date 1 to preserve the option to implement their preferred alternatives at date 2. Thus, at date 1, the τ-biased director blocks all τ alternatives and, symmetrically, the τ'-biased director blocks all τ' alternatives.

We now proceed to characterize a τ-biased director's payoffs at date 2 and then to show that she blocks all τ' policies at date 1. (The argument for the τ'-biased director is identical.)

Date 2. Since $b_\tau > v_h - v_\ell$, a τ-biased director prefers a low-quality τ-policy to a high-quality τ'-policy. Thus, she blocks any τ'-policy if any τ-policy is in place. A high-quality τ-alternative gets through at date 2 if x_0 or another τ-policy is in place. [18] Thus, the τ-biased director's payoffs as a function of the date-1 policy x_1 are as follows:

$$\tau \text{ director's payoff} = \begin{cases} v_0 + \delta\big(\bar{v} + p_\tau b_\tau\big) & \text{if } x_1 = x_0, \\ v_\ell + b_\tau + \delta\Big(p_\tau p_h v_h + (1 - p_\tau p_h) v_\ell + b_\tau\Big) & \text{if } x_1 \text{ is type } \ell\tau, \\ v_\ell + \delta\Big(p_{\tau'} p_h v_h + (1 - p_{\tau'} p_h) v_\ell\Big) & \text{if } x_1 \text{ is type } \ell\tau', \\ v_h + b_\tau + \delta\big(v_h + b_\tau\big) & \text{if } x_1 \text{ is type } h\tau, \\ v_h + \delta v_h & \text{if } x_1 \text{ is type } h\tau'. \end{cases} \tag{8}$$

[18] Formally, by the tie-breaking rule (Assumption 2), an h-quality τ-incumbent is not replaced by an h-quality alternative. But this is payoff equivalent for the diverse board here. (The tie-breaking rule matters only to simplify the analysis of the partially independent board.)

Date 1. Observe immediately that the τ-biased director prefers high-quality τ' policies to low-quality τ' policies at date 1. Now observe further that she prefers x_0 to high-quality τ'-policies, since

$$v_0 + \delta\Big(\bar{v} + p_\tau b_\tau\Big) > v_h + \delta v_h \tag{9}$$

if and only if

$$b_\tau > \frac{v_h - v_0 + \delta(v_h - \bar{v})}{\delta p_\tau}, \tag{10}$$

which follows from Assumption 1. Thus, she blocks any τ' alternative policy.

A.2 Proof of Corollary 1

The result follows from two observations. (i) For $\delta = 0$, directors care only about today's policy. Hence, they implement any alternative at date 1 (given the incumbent x_0 is very bad). There is no entrenchment. (ii) For $\delta \to \infty$, the condition in the corollary implies Assumption 1 (recalling that we allow for $\delta > 1$ since date 2 can represent more calendar time than date 1). Hence, there is entrenchment by Proposition 1.

A.3 Proof of Lemma 1

First observe that the tie-breaking rule in Assumption 2 implies that on a τ-ι partially independent board, the independent director votes for τ-policies over τ'-policies of the same quality. Thus, the only state in which the independent director votes against the τ-biased director at date 2 is when x_1 is $h\tau'$ and y_2 is $\ell\tau$; in words, when the incumbent is an h-quality τ'-policy and the alternative is an ℓ-quality τ-policy. In anticipation of this, the τ-biased director blocks the $h\tau'$ policy at date 1 whenever

$$v_0 + \delta\Big(\bar{v} + p_\tau b_\tau\Big) > v_h + \delta v_h + \delta p_\tau p_h b_\tau, \tag{11}$$

which is implied by Assumption 1.

The τ-biased director votes for of all other date-1 alternatives since they all increase her date-1 payoff and do not decrease her date-2 payoff.

A.4 Proof of Corollary 2 and Proposition 2

Here, we prove Corollary 2 first and Proposition 2 second.

A.4.1 Proof of Corollary 2

Consider the independent director on the τ-ι board. And suppose the date-1 alternative is $y_1 = \ell\tau$. If it becomes the incumbent, i.e. if $x_1 = y_1$, then τ-director will block the $h\tau'$ alternative at date 2, since $v_h - v_\ell < b_\tau$ by Assumption 1. Thus, the independent director's payoffs as a function of the date-1 policy x_1 are:

$$\iota \text{ director's payoff}\Big|_{y_1 \text{ is } \ell\tau} = \begin{cases} v_0 + \delta\bar{v} & \text{if } x_1 = x_0, \\ v_\ell + \delta\Big(v_h p_h p_\tau + v_\ell\left(1 - p_h p_\tau\right)\Big) & \text{if } x_1 \text{ is type } \ell\tau, \end{cases} \tag{12}$$

Comparing these payoffs, we find that the independent director blocks the $\ell\tau$-policy if and only if

$$v_\ell - v_0 < \delta p_h\left(1 - p_\tau\right)\left(v_h - v_\ell\right) \tag{13}$$

or $\Delta_\tau > 0$, which is the condition in the proposition.

For all other policies, the independent director votes in favor: he votes for any high-quality policy, and he does not block the $l\tau'$-policy because the other director will always agree to replace it by a high-quality alternative in the future.

A.4.2 Proof of Proposition 2

τ-τ board vs. τ-ι board. On a τ-biased board, directors always agree at date 2. Hence, there is no strategic blocking at date 1. Since $v_0 < v_\ell$, directors will always replace the inferior manager in period 1. Shareholders' expected payoff is

$$V_{\tau\text{-}\tau} = p_\tau p_h\Big(v_h + \delta v_h\Big) + p_{\tau'} p_h\Big(v_h + \delta p_\ell p_\tau v_\ell + \delta\left(1 - p_\ell p_\tau\right) v_h\Big) + \\ + p_\tau p_\ell\Big(v_\ell + \delta p_h p_\tau v_h + \delta(1 - p_h p_\tau) v_\ell\Big) + p_{\tau'} p_\ell\Big(v_\ell + \delta\bar{v}\Big). \quad (14)$$

Note that the second and third term follow from the fact that $v_h - v_\ell < b_\tau$ by Assumption 1: at date 2, τ-directors will replace a $h\tau'$-policy with a $\ell\tau$-policy but not a $\ell\tau$ policy with a $h\tau'$-policy.

On a τ-ι board, the analysis follows from Lemma 1 and Corollary 2. Recall that the ι director's strategy depends on whether $\Delta_\tau \lesseqgtr 0$. Hence, we consider these cases in turn.

Case 1: $\Delta_\tau > 0$. Shareholders' expected payoff $V_{\tau\text{-}\iota}^{\Delta_\tau<0}$ is

$$V_{\tau\text{-}\iota}^{\Delta_\tau<0} = p_\tau p_h\Big(v_h + \delta v_h\Big) + p_{\tau'} p_h\Big(v_0 + \delta\bar{v}\Big) + \\ + p_\tau p_\ell\Big(v_\ell + \delta p_h p_\tau v_h + \delta\left(1 - p_h p_\tau\right) v_\ell\Big) + p_{\tau'} p_\ell\Big(v_\ell + \delta\bar{v}\Big). \quad (15)$$

Hence

$$V_{\tau\text{-}\tau} - V_{\tau\text{-}\iota}^{\Delta_\tau<0} = p_{\tau'} p_h\Big(v_h + \delta p_\ell p_\tau v_\ell + \delta\left(1 - p_\ell p_\tau\right) v_h - v_0 - \delta\bar{v}\Big) \quad (16)$$

$$= p_{\tau'} p_h\Big(v_h - v_0 + \delta p_{\tau'} p_\ell (v_h - v_\ell)\Big) > 0. \quad (17)$$

Case 2: $\Delta_\tau > 0$. Here, shareholders' expected payoff $V_{\tau\text{-}\iota}^{\Delta_\tau>0}$ is

$$V_{\tau\text{-}\iota}^{\Delta_\tau>0} = p_\tau p_h\left(v_h + \delta v_h\right) + p_{\tau'} p_h\left(v_0 + \delta\bar{v}\right) + p_\tau p_\ell\left(v_0 + \delta\bar{v}\right) + p_{\tau'} p_\ell\left(v_\ell + \delta\bar{v}\right). \quad (18)$$

Hence

$$V_{\tau\text{-}\tau} - V_{\tau\text{-}\iota}^{\Delta>0} = p_{\tau'}p_h\Big(v_h + \delta p_\ell p_\tau v_\ell + \delta\left(1 - p_\ell p_\tau\right)v_h - v_0 - \delta\bar{v}\Big) + \tag{19}$$

$$+ p_\tau p_\ell\Big(v_\ell + \delta p_\tau p_h v_h + \delta\left(1 - p_h p_\tau\right)v_\ell - v_0 - \delta\bar{v}\Big) \tag{20}$$

$$= p_{\tau'}p_h\Big(v_h - v_0 + \delta p_{\tau'}p_\ell(v_h - v_\ell)\Big) + p_\tau p_\ell\Big(v_\ell - v_0 - \delta p_{\tau'}p_h(v_h - v_\ell)\Big) \tag{21}$$

$$= p_{\tau'}p_h\Big(v_h - v_0 + \delta p_{\tau'}p_\ell(v_h - v_\ell)\Big) - p_\tau p_\ell\Delta_\tau. \tag{22}$$

This is positive exactly when condition (3) in the statement of the proposition is satisfied.

τ-ι board vs. τ-τ' board. Here, we show that shareholders always prefer a τ-ι board to a τ-τ' board, i.e.

$$V_{\tau\text{-}\iota} - V_{\tau\text{-}\tau'} > 0, \tag{23}$$

where

$$V_{\tau\text{-}\tau'} = v_0 + \delta\bar{v}, \tag{24}$$

by Proposition 1, and $V_{\tau\text{-}\iota}$ is given by equation (15) if $\Delta_\tau \leq 0$ and by equation (18) if $\Delta_\tau \geq 0$.

Again, consider the two cases for $\Delta_\tau \lesseqgtr 0$.

Case 1: $\Delta_\tau < 0$. Substituting equations (24) and (15) into inequality (23) and simplifying, we see that the independent board is better than the diverse board if

$$p_\tau p_h(v_h - v_0) + p_\ell(v_\ell - v_0) + \delta p_\tau^2 p_\ell p_h(v_h - v_\ell) > 0. \tag{25}$$

This is always satisfied since $v_h > v_\ell > v_0$.

Case 2: $\Delta_\tau > 0$. Substituting equations (24) and (18) into inequality (23) and simplifying, we see that the independent board is better than the diverse board if

$$p_\tau p_h\Big(v_h - v_0 + \delta(v_h - \bar{v})\Big) + p_{\tau'}p_\ell(v_\ell - v_0) > 0. \tag{26}$$

This always is satisfied since $v_h > v_\ell > v_0$.

τ-τ board vs. τ-τ' board. Here, we show that a τ-biased board is always preferred to a diverse board, i.e.

$$V_{\tau\text{-}\tau} > V_{\tau\text{-}\tau'} \tag{27}$$

where $V_{\tau\text{-}\tau}$ and $V_{\tau\text{-}\tau'}$ are given by equations (14) and (24) respectively. Substituting, a τ-biased board is preferred to a diverse board if and only if

$$\begin{aligned} &p_\tau p_h\Big(v_h + \delta v_h\Big) + p_{\tau'} p_h\Big(v_h + \delta p_\ell p_\tau v_\ell + \delta\left(1 - p_\ell p_\tau\right) v_h\Big) + \\ &+p_\tau p_\ell\Big(v_\ell + \delta p_h p_\tau v_h + \delta(1 - p_h p_\tau) v_\ell\Big) + p_{\tau'} p_\ell\Big(v_\ell + \delta\bar{v}\Big) > v_0 + \delta\bar{v}. \end{aligned}$$

Simplifying and rearranging, we get that a τ-biased board is preferred to a diverse board if and only if

$$\bar{v} - v_0 + \delta p_\tau^2 p_\ell p_h\left(v_h - v_\ell\right) + \delta p_{\tau'}^2 p_h p_\ell (v_h - v_\ell) > 0, \tag{28}$$

which is always satisfied.

A.4.3 Non-stationary Qualities

Here, we relax the assumption that alternative qualities are identically distributed. In this setup, a diverse board can be preferred to a biased board. Hence, we can highlight that a diverse board has the benefit of preventing some low-quality policies from being implemented and becoming entrenched (like with a partially independent board (Corollary 2)). It has this benefit in the baseline model too, but it is always outweighed by another benefit of the biased board: by preventing date-1 entrenchment of x_0, the biased board gets a better set of policies to choose from at date 2.

We use the following notation. As above, p_h denotes the probability that the alternative is of type h at date 1, but now let $\hat{p}_h \neq p_h$ denote the probability that

the alternative is of type h at date 2. Analogously, as above, $\bar{v} = p_h v_h + p_\ell v_\ell$ denotes average value of date-1 alternatives, but let $\hat{v} := \hat{p} v_h + \hat{p}_\ell v_\ell$ denote the average value of date-2 alternatives (where $\hat{p}_\ell := 1 - \hat{p}_h$).

We now compare the value $V_{\tau\text{-}\tau}$ of a τ-τ board with the value $V_{\tau\text{-}\tau'}$ of a τ-τ' board: $V_{\tau,\tau} \geq V_{\tau,\tau'}$ if and only if

$$\begin{aligned} p_\tau p_h \Big(v_h + \delta v_h \Big) + p_{\tau'} p_h \Big(v_h + \delta \hat{p}_\ell p_\tau v_\ell + \delta \left(1 - \hat{p}_\ell p_\tau\right) v_h \Big) + \\ + p_\tau p_\ell \Big(v_\ell + \delta \hat{p}_h p_\tau v_h + \delta \left(1 - \hat{p}_h p_\tau\right) v_\ell \Big) + p_{\tau'} p_\ell \Big(v_\ell + \delta \hat{v} \Big) - \Big(v_0 + \delta \hat{v} \Big) \geq 0 \end{aligned} \tag{29}$$

Simplifying this expression is lengthy (although elementary), so we divide it into a few steps.

- *Date-1 value.* We can group the terms not multiplied by δ as follows,

$$p_h v_h + p_\ell v_l - v_0 = \bar{v} - v_0. \tag{30}$$

  This is always positive, implying a biased board always increases the date-1 value.

- *Date-2 value.* We can group the terms multiplied by δ as follows (omitting δ):

$$p_\tau \Big[p_h v_h \ + p_\ell \left(\hat{p}_h p_\tau v_h + \left(1 - \hat{p}_h p_\tau\right) v_\ell \right) - \hat{v} \Big] + \tag{31}$$

$$+ p_{\tau'} \Big[p_h \left(\hat{p}_\ell p_\tau v_\ell + \left(1 - \hat{p}_\ell p_\tau\right) v_h \right) + p_\ell \hat{v} - \hat{v} \Big] \tag{32}$$

  The first term in square brackets above can be rewritten as

$$\begin{aligned} & p_h v_h + p_\ell \left(\hat{p}_h p_\tau v_h + \left(1 - \hat{p}_h p_\tau\right) v_\ell \right) - \hat{v} \\ = \ & p_h v_h + p_\ell \hat{p}_h p_\tau (v_h - v_\ell) + p_\ell v_\ell - \hat{v} \\ = \ & p_\ell \hat{p}_h p_\tau \left(v_h - v_\ell \right) + \bar{v} - \hat{v} \end{aligned}$$

The second term in square brackets above can be rewritten as

$$\begin{aligned}
& p_h\left(\hat{p}_\ell p_\tau v_\ell + (1-\hat{p}_\ell p_\tau)\, v_h\right) + p_\ell \hat{v} - \hat{v} && (33)\\
= \;& -p_h \hat{p}_\ell p_\tau (v_h - v_\ell) + p_h v_h + p_\ell \hat{v} - \hat{v} && (34)\\
= \;& -p_h \hat{p}_\ell p_\tau (v_h - v_\ell) + p_h v_h + (1-p_\ell)\hat{v} && (35)\\
= \;& -p_h \hat{p}_\ell p_\tau (v_h - v_\ell) + p_h\big(v_h + (1-p_\ell)\hat{v}\big) && (36)\\
= \;& -p_h \hat{p}_\ell p_\tau (v_h - v_\ell) + p_h\big[v_h + \big((1-\hat{p}_\ell)v_h + \hat{p}_\ell v_\ell\big)\big] && (37)\\
= \;& -p_h \hat{p}_\ell p_\tau (v_h - v_\ell) + p_h \hat{p}_\ell (v_h - v_\ell) && (38)\\
= \;& p_{\tau'} p_h (1-p_\tau)\hat{p}_\ell (v_h - v_\ell). && (39)
\end{aligned}$$

In summary, the τ-biased board is better than the diverse board if and only if

$$p_\tau\left[p_\ell \hat{p}_h p_\tau\left(v_h - v_\ell\right) + \bar{v} - \hat{v}\right] + p_{\tau'}^2 p_h \hat{p}_\ell (v_h - v_\ell) \geq 0.$$

To see that this may be violated, set $v_\ell = 0$ and $\hat{p}_h = 1$, so $\hat{p}_\ell = 0$, $\hat{v} = v_h$, and $\bar{v} = p_h v_h$. The condition becomes

$$p_\tau\Big(p_\ell p_\tau v_h + p_h v_h - v_h\Big) \geq 0$$

which is never satisfied since $p_\ell p_\tau + p_h = 1 - p_\ell(1-p_\tau) < 1$.

A.5 Proof of Corollary 3

The result follows immediately from Proposition 2.

A.6 Proof of Corollary 4

First observe that, since $v_0 < v_l$ (the incumbent CEO is "very bad"), he is always fired at date 2. Hence, he just wants to minimize the probability he is fired at date 1, which varies with board composition as follows.

- With a τ-τ or ι-ι board, he is always fired at date 1, since there is no strategic blocking at date 1.
- With a τ-τ' board, on the other hand, he is never fired at date 1—he is entrenched by Proposition 1.
- With a τ-ι board, he is retained when y_1 is type $h\tau'$ (by Lemma 1) and, for some parameters, when y_1 is type $\ell\tau$ (Corollary 2) and fired otherwise.

Hence his ranking is τ-$\tau \sim \iota$-$\iota \prec \tau$-$\iota \prec \tau$-τ', as stated in the corollary.

A.7 Proof of Proposition 3

- With a τ-τ, τ-τ', τ-ι, or ι-ι board, the CEO is never fired: the $h\tau$-CEO is the best policy for both τ-biased directors and independent directors. Hence he is never fired because they always block less-preferred alternatives (keep him given equally-preferred alternatives by Assumption 2).
- With a τ'-ι board, he gets fired the first time there is an $h\tau'$-alternative, i.e. y_t is type $h\tau'$.
- With a τ'-τ' board he is fired the first time there is a τ'-alternative, i.e. y_t is type $h\tau'$ or $\ell\tau'$.

For a given y_t the τ'-ι board fires the CEO only if the τ'-τ' board does so (and the τ'-τ' board also fires the CEO for other realizations of y_t). Hence, the CEO (strictly) prefers the τ'-ι board to the τ'-τ' board.

In summary, the CEO's ranking is τ-$\tau \sim \tau$-$\tau' \sim \tau$-$\iota \sim \iota$-$\iota \succ \tau'$-$\iota \succ \tau'$-τ', as stated in the corollary.

A.8 Proof of Proposition 4

CEO's objective. Recall that the CEO maximizes his expected tenure (see footnote 16). Since we want to allow date 1 and date 2 to represent different amounts of

calendar time, we assume his objective is given by

$$U = \mathbb{P}\Big[\text{employed at date 1}\Big]w_1 + \mathbb{P}\Big[\text{employed at date 2}\Big]w_2, \tag{40}$$

where the weights w_t could represent his wage at date t or, alternatively, the ratio w_2/w_1 could represent his rate of time preference if he just values being employed.

CEO payoff given board compositions. Consider each of the six possible board compositions.

1. τ-τ *board.* Here, the CEO is fired the first time there is an $h\tau$-alternative. (Recall that the τ-biased director prefers the $\ell\tau$-CEO to the $h\tau'$-CEO by Assumption 1.) Hence,

$$U_{\tau\text{-}\tau} = (1 - p_\tau p_h)w_1 + (1 - p_\tau p_h)^2 w_2. \tag{41}$$

2. τ-ι-*board.* Here, the board's decision rule coincides with that of the $\tau\tau$-board. Hence,

$$U_{\tau\text{-}\iota} = (1 - p_\tau p_h)w_1 + (1 - p_\tau p_h)^2 w_2. \tag{42}$$

3. τ-τ'-*board.* Here, as in the simpler cases above, there is no strategic blocking. The reason is that the τ-director blocks *any* τ'-alternative CEO of type τ' (since she prefers the $\ell\tau$-CEO to an $h\tau'$-CEO by Assumption 1). As a result, the τ'-director knows she can never hire a τ'-CEO, and hence wants to hire a high-quality τ-CEO as soon as possible. The CEO is fired the first time there is a $h\tau$-alternative, as with the τ-τ and τ-ι boards. Hence,

$$U_{\tau\text{-}\tau'} = (1 - p_\tau p_h)w_1 + (1 - p_\tau p_h)^2 w_2. \tag{43}$$

4. ι-ι-*board.* Here, the CEO is fired the first time there is a high-quality alterna-

tive. Hence,

$$U_{\iota\text{-}\iota} = (1-p_h)w_1 + (1-p_h)^2 w_2 = p_\ell w_1 + p_\ell^2 w_2. \tag{44}$$

5. τ'-τ' *board.* Here, the CEO is fired the first time there is a τ'- or high-quality alternative. Hence,

$$U_{\tau'\text{-}\tau'} = p_\tau p_\ell w_1 + (p_\tau p_\ell)^2 w_2.$$

6. τ'-ι-*board.* Here, there is strategic blocking. Specifically, by an argument analogous to that of Lemma 1, the τ'-biased director strategically blocks $h\tau$, since

$$v_h + \delta\Big(v_h + p_{\tau'} p_h b_{\tau'}\Big) < v_\ell + \delta\Big(\bar{v} + p_{\tau'} b_{\tau'}\Big) \tag{45}$$

by Assumption 1.[19] And, by an argument analogous to Corollary 2, the independent director blocks $\ell\tau'$, since if she is indifferent between the incumbent $\ell\tau$ and the alternative $\ell\tau'$ today, but if $\ell\tau'$ is appointed today, the τ'-biased director will prevent her from appointing an $h\tau$ alternative in the future.

Hence,

$$U_{\tau'\text{-}\iota} = (1-p_{\tau'}p_h)w_1 + (1-p_{\tau'}p_h)p_\tau p_\ell w_2. \tag{47}$$

CEO's ranking. From the computations above, we can observe immediately that

$$U_{\tau\text{-}\tau} = U_{\tau\text{-}\iota} = U_{\tau\text{-}\tau'} > U_{\iota\text{-}\iota} > U_{\tau'\text{-}\tau'}. \tag{48}$$

The question is how $U_{\tau'\text{-}\iota}$ compares with the above.

[19] To see this, observe equation (45) can be rewritten as

$$b_{\tau'} > \frac{v_h - v_\ell + \delta(v_h - \bar{v})}{\delta p_\ell p_{\tau'}} = \frac{1+\delta p_\ell}{\delta p_\ell p_{\tau'}}(v_h - v_\ell) \tag{46}$$

which is Assumption 1

- $U_{\tau'\text{-}\iota} > U_{\tau\text{-}\tau}$ if

$$(1 - p_{\tau'}p_h)w_1 + (1 - p_{\tau'}p_h)p_\tau p_\ell w_2 > (1 - p_\tau p_h)w_1 + (1 - p_\tau p_h)^2 w_2 \tag{49}$$

or

$$(p_\tau - p_{\tau'})p_h w_1 + (-p_{\tau'} - p_{\tau'}p_\tau p_h p_\ell - p_\tau^2 p_h^2 + p_\tau p_h)w_2 > 0 \tag{50}$$

or

$$(p_\tau - p_{\tau'})p_h w_1 > \Big(p_{\tau'} - p_\tau p_h(p_{\tau'}p_h + p_\tau p_\ell)\Big)w_2. \tag{51}$$

This is always satisfied for p_τ sufficiently large (i.e. $p_{\tau'}$ sufficiently small), giving the ranking in the proposition.

- $U_{\tau'\text{-}\iota} > U_{\iota\text{-}\iota}$ if

$$(p_\ell p_\tau + p_h p_{\tau'})w_1 + (p_\ell p_\tau + p_h p_{\tau'})(1 - p_\ell p_\tau)w_2 > p_\ell w_1 + p_\ell^2 w_2. \tag{52}$$

- $U_{\tau'\text{-}\iota} > U_{\tau\text{-}\tau'}$ if

$$(p_\ell p_\tau + p_h p_{\tau'})w_1 + (p_\ell p_\tau + p_h p_{\tau'})(1 - p_\ell p_\tau)w_2 > (1 - p_\tau p_h)w_1 + (1 - p_\tau p_h)^2 w_2. \tag{53}$$

In summary, $\tau\text{-}\tau \sim \tau\text{-}\iota \sim \tau\text{-}\tau' \succ \iota\text{-}\iota \succ \tau'\text{-}\tau'$ and the ranking of $\tau'\text{-}\iota$ depends on the inequalities (49), (52), and (53) above, as stated in the proposition.

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